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Interim Report

Trends of a Mountain Pine Beetle Infestation in a High Elevation Stand in Yellowstone National Park

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INTRODUCTION

This report describes the results of a trend study designed to measure the yearly losses caused by the mountain pine beetle in a high elevation lodgepole pine stand in Yellowstone National Park. This study was initiated in 1972 and was patterned after a similar trend study by Parker, 1973. 1/ The Park was selected to avoid the direct influence of timber cutting adjacent to the study plot.

The bark beetle infestation in the study area is part of an extensive outbreak on the Targhee and Gallatin National Forests. Permanent fixed area plots were established in a 320 acre tract of lodgepole pine saw-timber along the west boundary of the Park. Mean elevation of the area is 8300 feet.

METHODS

Mountain pine beetle caused mortality was recorded on 32 permanent rectangular strip plots (1/2 X 10 chains) established on 4 parallel cruise lines. Cruise lines were 1 mile long and spaced 10 chains apart. All beetle-caused mortality 5.5 inches dbh and larger was recorded and marked with year of attack on metal tags.

Each year following the initial survey, previously marked new attacks were checked to confirm mortality and, when necessary, the tree tally was corrected for that year. This technique of yearly surveys and rechecks provided an accurate count of trees killed by the mountain pine beetle each year.

During the initial cruise, green stand data were collected on 32 variable radius plots located at the center of each strip plot. Only trees 5.5 inches dbh and larger were recorded.

RESULTS AND DISCUSSION

Green stand prior to the infestation was reconstructed using green stand and mortality data from the original cruise. Total stems per acre were 130.7 above 5.5 inches dbh. Stand composition by trees per acre was: lodgepole pine 116.1, whitebark pine 4.6, subalpine fir 9.7, and Engelmann spruce 0.5. Table 1, in the appendix shows the stand composition by diameter class.

1/ Parker, D.L. 1973. Trend of a mountain pine beetle outbreak. J. Forest. 71(11):668-670.

Of the 120.6 host trees per acre, cumulative mortality has been 6.9 trees per acre or 5.6 percent. Mortality of lodgepole pine by year in trees per acre was 0.38 in 1970, 2.01 in 1971, 1.77 in 1972, 1.20 in 1973, and 0.76 in 1974. Whitebark pine mortality occurred at a much lower rate and by year was zero in 1970, 0.36 in 1971, 018 in 1972, 0.12 in 1973 and 0.06 in 1974. Tables 2 and 3 list the mortality by year and diameter class. Peak tree killing for both host species occurred in 1971 the second year of the infestation.

The yearly trend of this infestation is different and the number of trees killed was much less than recorded at a lower elevation by Parker, 1973 (Figure 2). If the present trend continues, the length of both infestations will be about the same.

Climate was probably the major factor contributing to the reduced rate of tree mortality at the higher elevation. After the first five years of the infestation, there are 113.7 green trees per acre or 95 percent of the host trees.

Data collection will continue until the infestation subsides.

APPENDIX

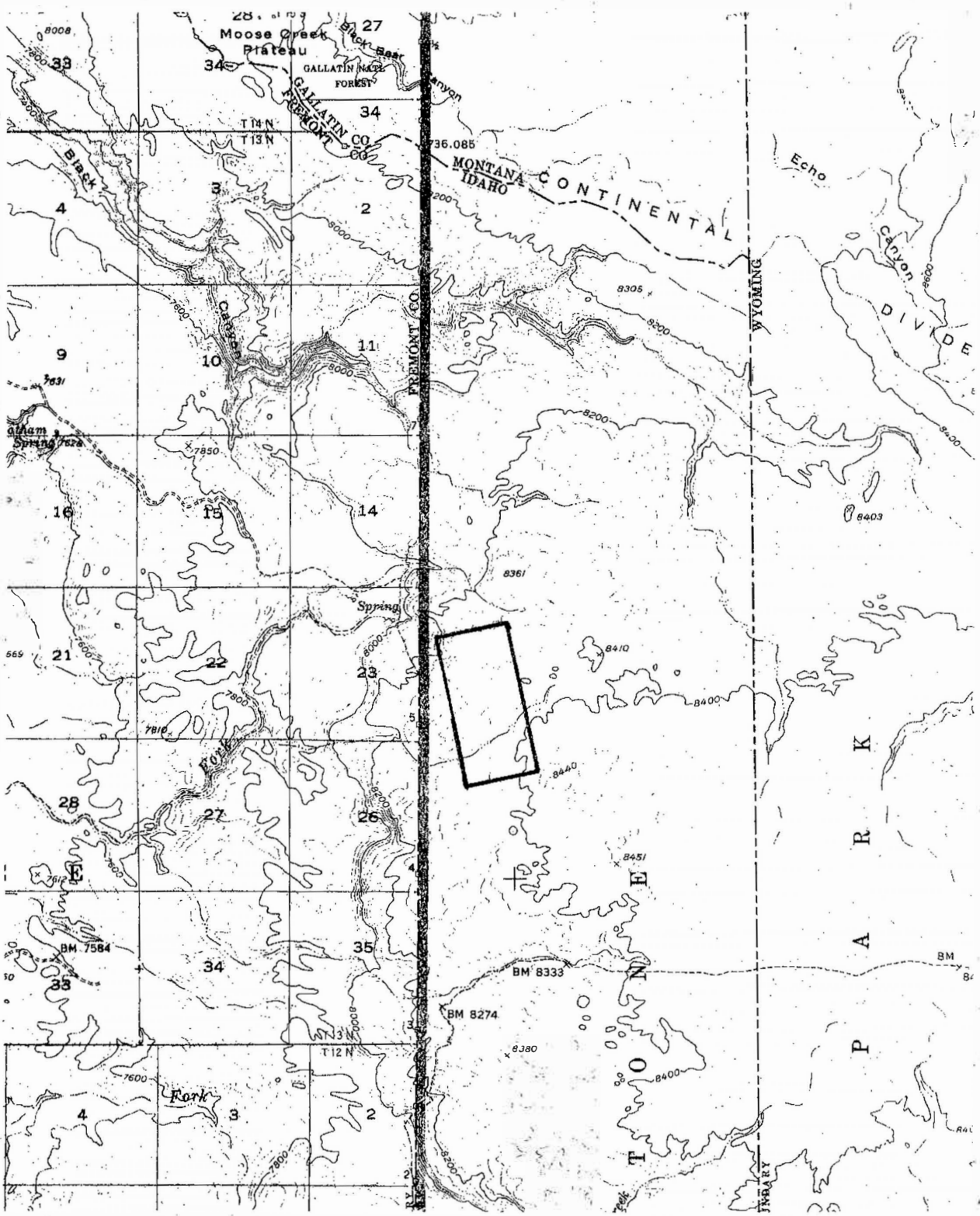

Figure 1. Location of the study area in Yellowstone National Park.

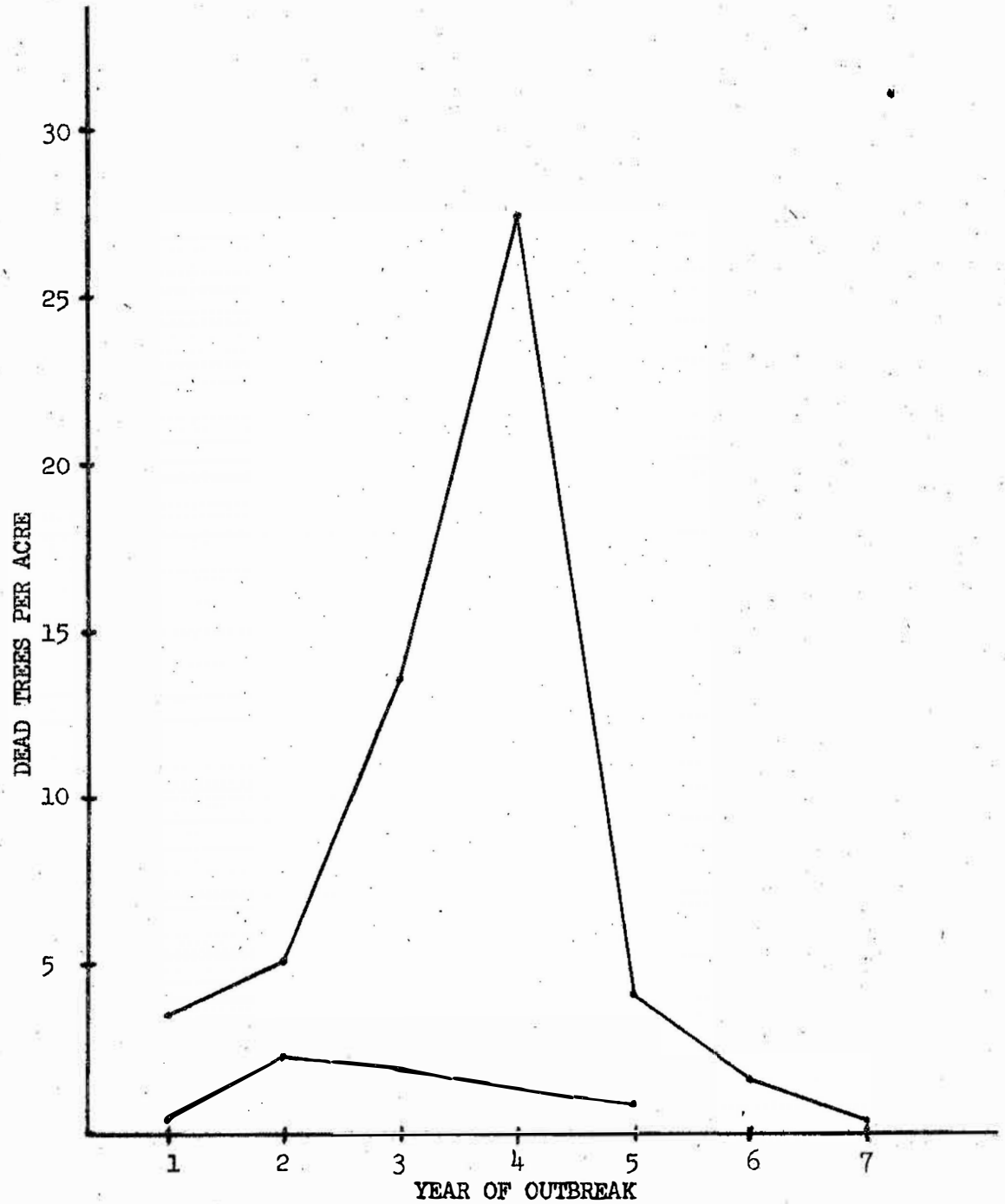

Figure 2. Comparison of yearly trend in trees per acre in two separated stands in Yellowstone National Park. Red line (6400 feet) Green line (8300 feet)

Table 1. Green stand structure of the survey area before the mountain Pine beetle infestation in a high elevation stand in Yellowstone National Park.

Diameter Class	Green Stems Per Acre				
	Lodgepole Pine	Whitebark Pine	Subalpine Fir	Engelmann Spruce	
6	7.96	1.59	3.18		
7	7.02		1.17		
8	7.22		.90		
9	8.55		.71		
10	9.74		--		
11	11.02	.47	.95		
12	11.33	.46	.40		
13	10.42		1.02		
14	9.54	.95	.59		
15	11.71	.32	--		
16	6.52	.12	.22		
17	6.17	--	--		
18	3.40	.06	--		
19	1.46	.06	.16		
20	1.83	.14	.29		
21	.78	--	--		
22	.24	.18	.12		
23	.35	.06		.11	
24	.59	--		--	
25	.06	--		--	
26	--	.09		.09	
27	--			--	
28	.06			--	
29	.07			.07	
30	--			--	
31	--			--	
32				.06	
33		.05		.05	
34				--	
35				.05	
36				--	
37				.04	TOTAL
TOTAL	116.04	4.55	9.71	.47	130.77

Table 2. Mountain pine beetle caused mortality of lodgepole pine by year and diameter class in a high elevation stand in the Yellowstone National Park.

Diameter Class	Dead Lodgepole Pine Per Acre Year of Attack					
	1970	1971	1972	1973	1974	Cumulative
8			.06			.06
9			.06			.06
10			--			--
11			.13	.06		.19
12		.13	.06	.06	.13	.38
13	.06	.06	.13	.06	--	.31
14	--	--	.19	.13	.13	.45
15	--	.50	--	.13	.19	.82
16	--	.19	.06	.25	.13	.63
17	.13	.50	.19	--	.06	.88
18	.13	.13	.13	.13	.06	.58
19	--	--	.19	.19	.06	.44
20	.06	.06	.13	.13		.38
21		.13	.13			.26
22		.06	.06			.12
23		.13	--			.13
24		.06	.13			.19
25		--	.06			.06
26		--	--			--
27		--	--			--
28		.06	.06			.12
33		--	--	.06		.06
Total	0.38	2.01	1.77	1.20	0.76	6.12

Table 3. Mountain pine beetle caused mortality of whitebark pine by year and diameter class in a high elevation stand in Yellowstone National Park.

Diameter Class	Dead Whitebark Pine Per Acre Year of Attack					
	1970	1971	1972	1973	1974	Cumulative
8						
9						
10						
11						
12	N	.06				.06
13	O					—
14	N		.06		.06	.12
15	E		.06			.06
16		.06	.06	.06		.18
17		.06		—		.06
18		.06		—		.06
19		—		—		—
20		—		—		—
21		—		.06		.06
22		.06				.06
23		.06				.06
Total	0	0.36	0.18	0.12	0.06	0.72